

## VOYAGER CARTOGRAPHY

R.M. Batson, E.M. Lee, and K.F. Mullins, U.S. Geological Survey,  
Flagstaff, AZ 86001

The Jovian and Saturnian satellites are being mapped at several scales from Voyager 1 and 2 data [1,2,3]. The maps are specially formatted color mosaics [4], controlled photomosaics, and airbrush maps.

At 1:5,000,000 scale, mapping of Io, Europa, and Ganymede is complete and mapping of Callisto is approximately 30% complete. At 1:15,000,000 scale, mapping of Io and Europa mapping is complete, and mapping of Ganymede is approximately 40% complete.

A controlled mosaic of Rhea has been compiled as a Digital Image Model (DIM) in the same format as is being used for Mars [5]. The mosaic is being formatted for publication as a two-sheet set (Lambert Azimuthal Equal Area, Mercator, and Polar Stereographic projections). Magnetic tape copies of the DIM have been distributed to Regional Planetary Image Facilities and other interested users. The DIM has a scale of 1/16 degree/pixel, corresponding to approximately 833 m/pixel on Rhea.

Details of the status of the various map series are reported quarterly to Planetary Geology Principal Investigators.

## References

- [1] Batson, R.M., Bridges, P.M., Inge, J.L., Isbell, C.E., Masursky, Harold, Strobell, M.E., and Tyner, R.L., 1980, Mapping the Galilean satellites of Jupiter with Voyager data: Photogrammetric Engineering and Remote Sensing, 46, 10, p. 1303-1312.
- [2] Batson, R.M., Bridges, P.M., and Mullins, K.F., 1981, Voyager cartography: Reports of the Planetary Geology Program-1981, NASA TM 84211, p. 484-485.
- [3] Batson, R.M., Bridges, P.M., Inge, J.L., Lee, E.M., Masursky, Harold, Mullins, K.F., Skiff, B.A., and Strobell, M.E., 1984, Voyager 1 and 2 atlas of six Saturnian satellites: NASA Spec. Pub. SP 474, 175 p.
- [4] McEwen, A.F., and Soderblom, L.A., 1984, High-resolution color images of Io: Reports of the Planetary Geology Program-1983, NASA TM 86246, p. 38.
- [5] Batson, R.M., 1986, Digital cartography of Mars: Reports of the Planetary Geology and Geophysics Program-1986, NASA TM (this volume).

#### ASPECTS OF VOYAGER PHOTOGRAMMETRY

Sherman S. C. Wu, Francis J. Schafer, Raymond Jordan and Annie-Elpis Howington, U.S. Geological Survey, Flagstaff, Arizona 86001

In January 1986, Voyager 2 took a series of pictures of Uranus and its satellites with the Imaging Science System (ISS) on board the spacecraft (Smith et al., 1986). Based on six stereo-images from the ISS narrow-angle camera, a topographic map was compiled of the southern hemisphere of Miranda, one of Uranus' moons (Fig. 1). Assuming a spherical figure, a 20-km surface relief is shown on the map. The images used were FSC268-4611, -4614, -1617, -4626, and -4629. With three additional images (FSC268-4409, -4413, and -4630) from the ISS wide-angle camera, a control network of Miranda's southern hemisphere was established by analytical photogrammetry, producing 88 ground points for the control of multiple-model compilation on the AS-11AM analytical stereoplotter.

The calibrated focal lengths of the wide-angle and narrow-angle cameras on board the spacecraft are, respectively, 200.77 mm and 1,503.49 mm (Davies et al., 1979). Each frame of the two cameras consists of 800 x 800 image elements with a pixel size of 14)m. Both cameras have a grid of 202 reseau marks. Calibration of reseau coordinates has an accuracy of better than 2)m (Benesh and Jepsen, 1978). Residuals of images produced from the Optronics Photowrite range from 8 to 17)m. Decalibration was made by the U.S. Geological Survey image-processing facility in Flagstaff, using reseau calibration data. For the control network, coordinate measurements were further corrected by a second-degree polynomial. Residuals of measurements were then reduced to 6 to 8)m, about half an image element. Images used for map compilation were obtained at altitudes ranging from 30,000 to 42,000 km. Control-network adjustment has a precision of about 375 m.

Digital terrain data from the topographic map of Miranda have also been produced. By combining these data and the image data from the Voyager 2 mission, perspective views or even a movie of the mapped area can be made.

The application of these newly developed techniques to Voyager 1 imagery, which includes a few overlapping pictures of Io and Ganymede, enables the compilation of contour maps or topographic profiles of these bodies on the analytical stereoplotters.

#### References

- Benesh, M., and Jepsen, P., 1978, Voyager Imaging Science System calibration report: Jet Propulsion Laboratory 618-802, 287 p.
- Davies, M. E., Hange, T. A., Katayama, F. Y., and Roth, J. A., 1979, Control network for the Galilean satellites, November 1979: R-2532 - JPL/NASA, The Rand Corporation.
- Smith, B. A., Soderblom, L. A., Beebe, R., Bliss, D., Boyce, J. M., Brahic, A., Briggs, G. A., Brown, R. H., Collins, S. A., Cook, A. F., II, Croft, S. K., Cuzzi, J. N., Danielson, G. E., Davies, M. E., Dowling, T. E., Godfrey, D., Hansen, C. J., Harris, C., Hunt, G. E., Ingersoll, A. P., Johnson, T. V., Krauss, R. J., Masursky, H., Morrison, D., Owen, T., Plescia, J. B., Pollack, J. B., Porco, C. C., Rages, K., Sagan, C., Shoemaker, E. M., Sromovsky, L. A., Stoker, C., Strom, R. G., Suomi, V. E., Synnott, S. P., Terrile, R. J., Thomas, P., Thompson, W. R., and Veverka, J., 1986, Voyager 2 in the Uranian System: Imaging Science Results: Science, 233, 43-64.